A SANITARY AND BACTERIOLOGICAL SURVEY OF VICTORIA HARBOUR AND WESTMORELAND RIVER, PRINCE EDWARD ISLAND SHELLFISH GROWING AREA # 8

by

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FOREWORD

This report is the result of a joint investigation by the Environmental Protection Service and the Prince Edward Island Department of the Environment.

Without the excellent cooperation and assistance provided by the Prince Edward Island Department of the Environment, this investigation would not have been possible. The author, however, is completely responsible for the interpretation of the data and the conclusions of this report.

ABSTRACT

A sanitary and bacteriological survey of Victoria Harbour and the Westmoreland River, Prince Edward Island, was conducted from May 15 to August 17, 1976. The purpose of this survey was to reasses the present classification of this area for the harvesting of shellfish.

A total of 117 water samples from 29 locations were analysed for fecal coliform bacteria. In addition, fecal streptococci analyses were conducted on samples from selected sampling stations following a major rainfall on July 15.

Bacteriological data obtained during 1976 indicates that Victoria Harbour and the Westmoreland River, with the exception of the upstream portion of the River, consistently meets established water quality criteria for an approved shellfish harvesting area. The presence of two undisinfected domestic waste sources on the upstream portion of the Westmoreland River i.e. the Crapaud sewage lagoon and Engelwood Regional High School, confirm the need for a shellfish closure on the River.

It is recommended that a new closure be implemented on the Westmoreland River as shown in Figure 5 of this report and Victoria Harbour and the remainder of the Westmoreland River be opened to the harvesting of shellfish.

RESUME

Du 15 mai au 17 août 1976, on a fait une étude sanitaire et bactériologique des eaux de havre Victoria et de la rivière Westmoreland (Île-du-Prince-Edouard) afin de réévaluer leur classification coquillière.

On a compté les coliformes fécaux de 117 échantillons d'eau prélevés en 29 endroits et les streptocoques fécaux d'autres échantillons recueillis dans des stations choisies après les fortes précipitations du 15 juillet.

Les données bactériologiques accumulées au cours de 1976 montrent que le havre et la rivière, à l'exception de sa partie d'amont, répondent constamment aux critères de qualité de l'eau convenant à l'exploitation autorisée des mollusques. En amont de la rivière, les eaux d'égouts domestiques non traitées du bassin de stabilisation de Crapaud et de l'école secondaire régionale Engelwood justifient d'interdire l'exploitation des mollusques sur la rivière.

On recommande d'interdire un nouveau secteur de la Westmoreland (voir la figure n^{o} 5) et de permettre l'exploitation des mollusques dans le havre Victoria et le reste de la rivière.

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1. INTRODUCTION

From May to August, 1976, the Environmental Protection Service conducted a sanitary and bacteriological survey of Victoria Harbour and the Westmoreland River, P.E.I. (Shellfish Area P.E.I. - 8).

The purpose of this survey was to re-evaluate the extent of fecal pollution in the area and to review the restriction that applies to shellfish harvesting. At present shellfishing is prohibited as defined in Schedule F of the Prince Edward Island Fisheries Regulations (8-1),as follows:

> "Victoria Harbour and Westmoreland River, Queens County, inside or north of a straight line drawn across the harbour from Oyster Survey Monument No. 1 as shown on the plan showing Oyster Leases in Victoria Harbour, to Oyster Survey Monument No. 2, as shown on that plan.

Figure 1 presents a map of the survey area showing the existing closure line.

The most recent survey of this area was a sanitary survey conducted by Baxter (1) in 1970. Sanitary conditions in the area at the time were felt to be significant enough to warrant the retention of the existing closure. The information presently available indicates that a bacteriological survey has not been conducted in this area since 1950.

Sanitary and bacteriological surveys of shellfish growing water are routinely carried out by E.P.S. The objectives of these surveys is to determine if direct harvesting of shellfish is acceptable. From a public health standpoint, the principal purpose is to detect the occurence of disease-causing organisms that may be accumulated by shellfish if domestic sewage or animal wastes reach their environment.

To assess the degree of fecal pollution in water, the fecal coliform "Most Probable Number" (MPN) test is currently used in the Canadian Shellfish Sanitation Program. Water is considered acceptable is the median of the test results at a sampling station does not exceed 14 MPN per 100 ml, and if not more than 10 percent of the test results exceed 43 MPN per 100 ml.(2)

Before areas are designated contaminated or approved, however, all factors that have a bearing on potential contamination levels are considered in addition to the bacteriological results.

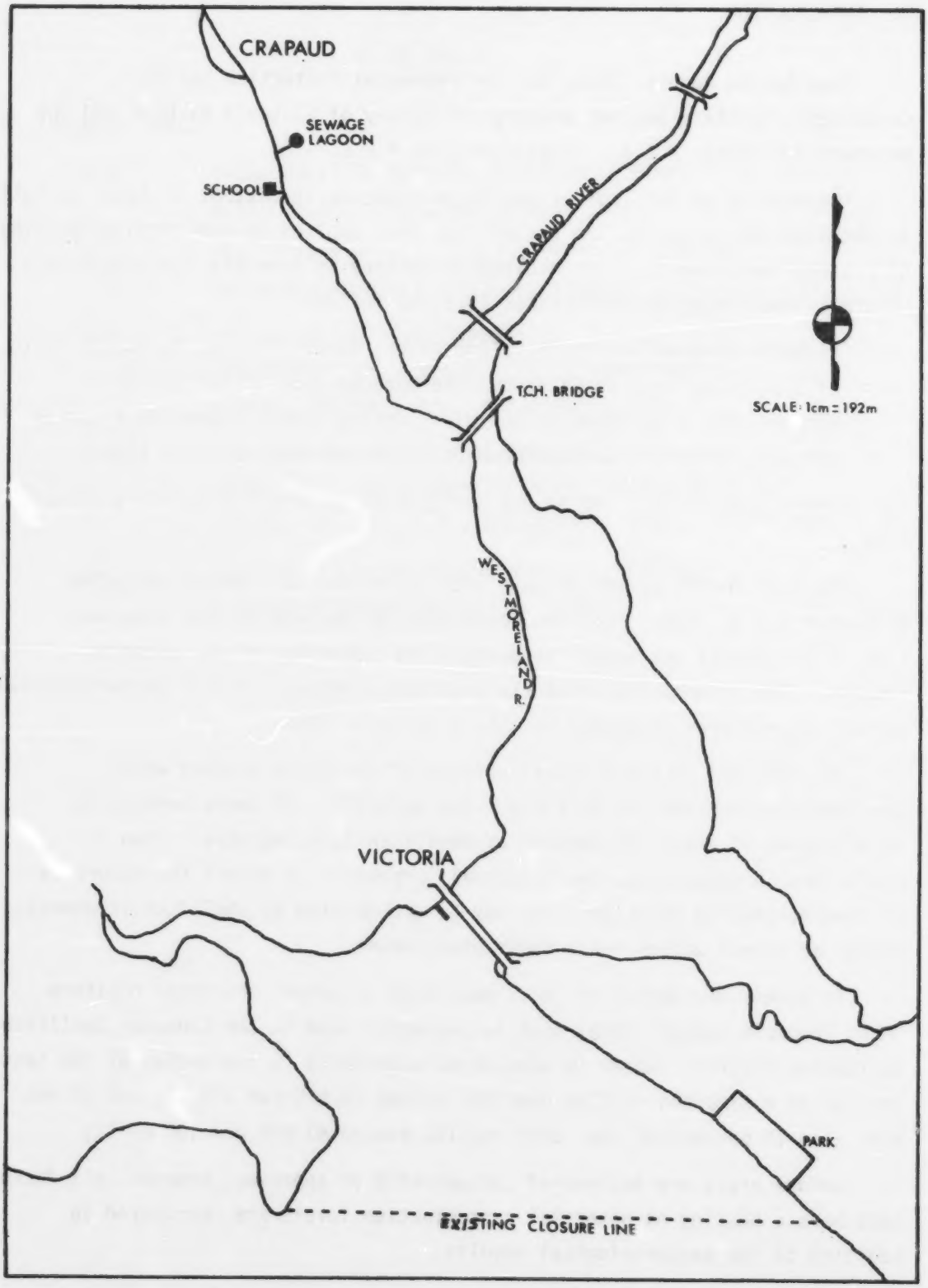

FIGURE 1 MAP OF SURVEY AREA SHOWING EXISTING CLOSURE LINE

2. MATERIALS AND METHODS

2.1 Sample Collection

Water samples were collected in sterile glass bottles of 100 or 250 ml volume using a rod-sampling device to lower the bottles to a depth of about 0.5 meters.

All samples were stored in an insulated container, transported, and processed in a mobile laboratory within two to three hours after collection.

2.2. Bacteriological Analyses

Fecal coliform tests were performed on all samples using the "Most Probable Number" (MPN) Technique (3). Three 5-tube MPN series were inoculated with appropriate aliquots of sample (decimal dilutions). In the first stage of the procedure, Bacto-Lauryl-Tryptose Broth was used as growth medium. These tubes were incubated at 35°C for 48 hours, or if gas formation was detectable sooner, for 24 hours. Gas-positive culture were then transferred to Bacto-EC medium and incubated at 44.5°C in a circulating water bath. Gas formation after 24 hours constituted the confirming stage of the test.

Fecal Streptococcal tests were performed on all samples using the "membrane filter" technique (3). Appropriate decimal dilutions of the sample were filtered through a sterile membrane filter by means of filtration apparatus. The membrane filters were then transferred aseptically to the surface of pre-poured culture dishes containing M-Enterococcus agar. Cultures were incubated at 35°C for 48 hours. Bacterial colonies producing a dark red to pink colour were counted using a low-power binocular wide-field microscope, and the fecal streptococcal density calculated per 100 ml.

2.3 Additional Data

Salinity and temperature were determined at selected stations in situ using either the Knudsen Method (4) or a Beckman Induction salinometer, model RS5-3. The tidal stage was estimated and recorded for each sampling run. In addition, records of daily precipitation during the sampling period for Charlottetwon and Summerside, P.E.I., were obtained from the Atmospheric Environment Service, Environment Canada, Halifax, N.S.

3. SANITARY CONDITIONS

Victoria Harbour lies along the south coast of P.E.I. on the Northumberland Strait, approximately half-way between Charlottetown and Summerside. The Westmoreland River flows southward to Victoria Harbour and is joined by the Crapaud River just above the Trans-Canada Highway (T.C.H.) bridge.

The Crapaud River drains an extensive area consisting primarily of woodland with a few small farms. There are a few buildings located on its banks and this River appears to contribute a negligible amount of contamination.

The upstream portion of the Westmoreland River drains a somewhat smaller area of farms and woodland. The village of Crapaud is located on the upstream portion of the River and has a population of approximately 300. Domestic wastes from the village and industrial waste from a creamery and a poultry plant enter a collection system to a 2.5 acre lagoon located on the east side of the River. The lagoon discharges an unchlorinated effluent directly to the Westmoreland River. Downstream from the lagoon, the Englewood Regional High School is located on the west bank and domestic wastes from the school flow to a septic tank with an outfall to the River.

The western bank of the Westmoreland River, from the school to the village of Victoria, consists mainly of farmland with some wooded areas. The eastern bank slopes gently to the River and consists entirely of farmland; approximately 35 head of cattle are pastured here. Several cottages are located on the River bank but no outfalls were observed and these are presumed to be serviced by septic tanks and tile fields. A small creek drains farmland (15 cattle) from the east into the cove in the southern section of the River.

The village of Victoria, population 200, is located on the north shore of Victoria Harbour. Domestic waste is handled by means of septic tanks and tile fields. A wharf facility is located at Victoria and is utilized by approximately 6-7 fishing boats, mainly from May 1 to June 30 and August 10 to October 10. A restaurant and live lobster holding facility are located on the wharf. The restaurant, serviced by a septic tank which is pumped out twice weekly by a septic tank service, operates only during the tourist season. A fish canning plant is located immediately west of the wharf. This plant has not operated for the past several years but during its operation

domestic waste and plant wastewater were discharged directly to the Harbour. There is a possibility this plant may operate in the near future.

A small creek drains farm and grazing land (20 cattle) to the west of the village of Victoria and enters the Harbour.

Immediately east of Victoria, the Westmoreland River enters the Harbour and is spanned at this point by a causeway. Victoria Provincial Park is located on the eastern shore of the Harbour near the existing closure line. This small park does not have a campground at present but existing washroom facilities are services by septic tank and tile fields.

No other potential pollution sources were noted in this area.

A signigicant shellfish resource exists in this area, consisting primarily of clams and quauhaugs. These are located mainly on the bar in Victoria Harbour and on the Westmoreland River just above the Victoria causeway.

4. BACTERIOLOGICAL RESULTS

The survey area was sampled on six days from May 15 to August 17 at 29 sampling stations. A total of 117 samples were analysed for fecal coliform bacteria. The results of these analyses are presented in Appendix Table A-1. In addition, fecal streptococci analyses were also performed at selected sampling stations on July 15. These results are given in Appendix Table A-2, along with corresponding fecal coliform values.

Figure 2 describes the sampling station locations for the area during 1976. Median fecal coliform distributions for the survey period are depicted in Figure 3. All median levels, with the exception of stations 27, 28, and 29 were less than 14 MPN fecal coliform/100 ml. Figure 4 presents the maximum fecal coliform distributions for the survey period. All sampling stations had fecal coliform 90 percentiles of less than 43 MPN/100 ml.

Rainfall data for the survey period are given in Appendix Table B-1 for Summerside, P.E.I. and Appendix Table B-2 for Charlottetown, P.E.I. No precipitation data are available for Victoria itself, however, precipitation for this area would be expected to be somewhere in the range between Summerside and Charlottetown. Rainfall levels during the survey period ranged from a trace amount prior to sampling on June 18, to between 24.7 - 25.9 mm during the 48 hours preceeding sampling on July 15.

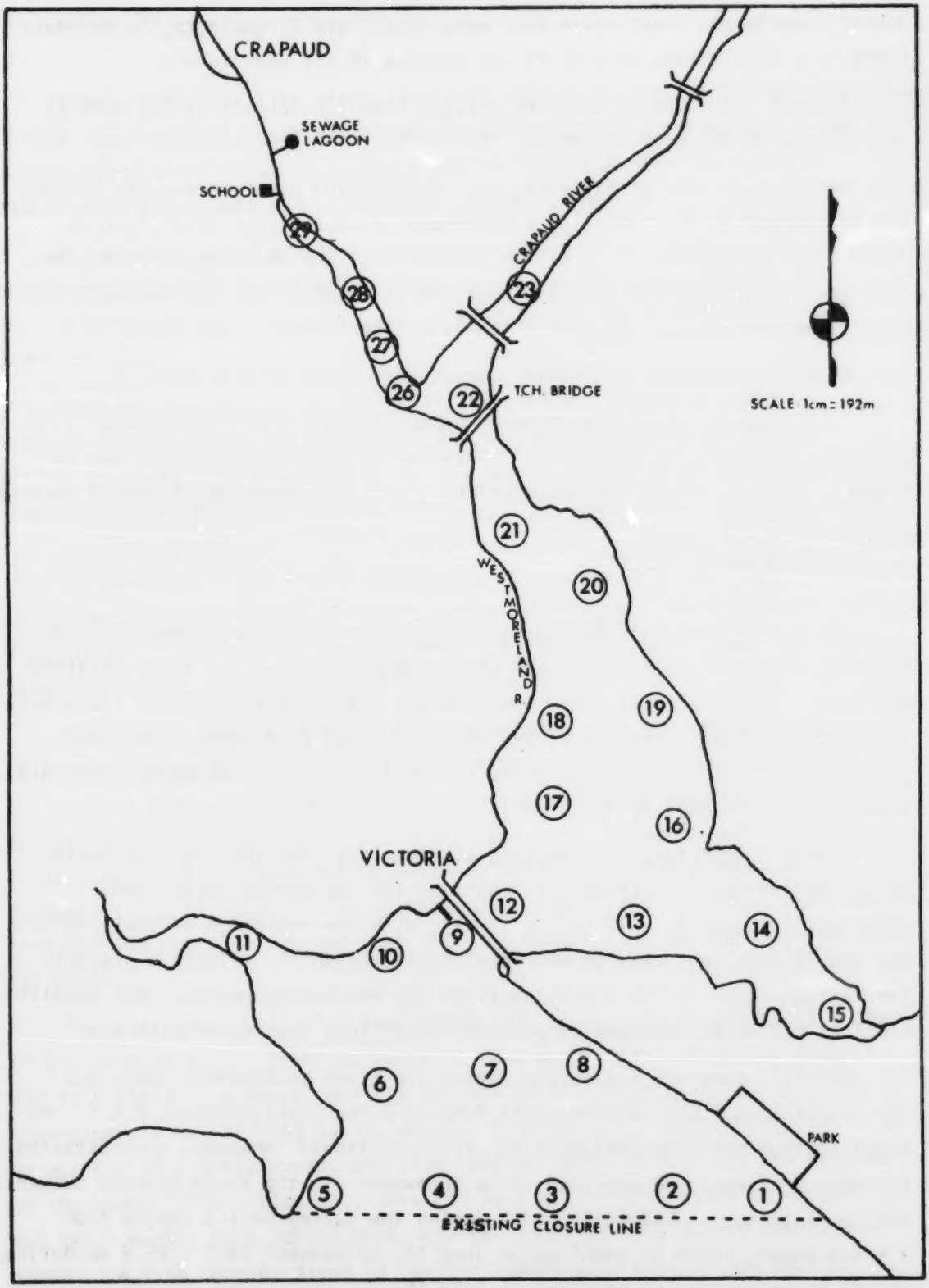

FIGURE 2 MAP OF SURVEY AREA SHOWING LOCATION OF SAMPLING STATIONS, 1976

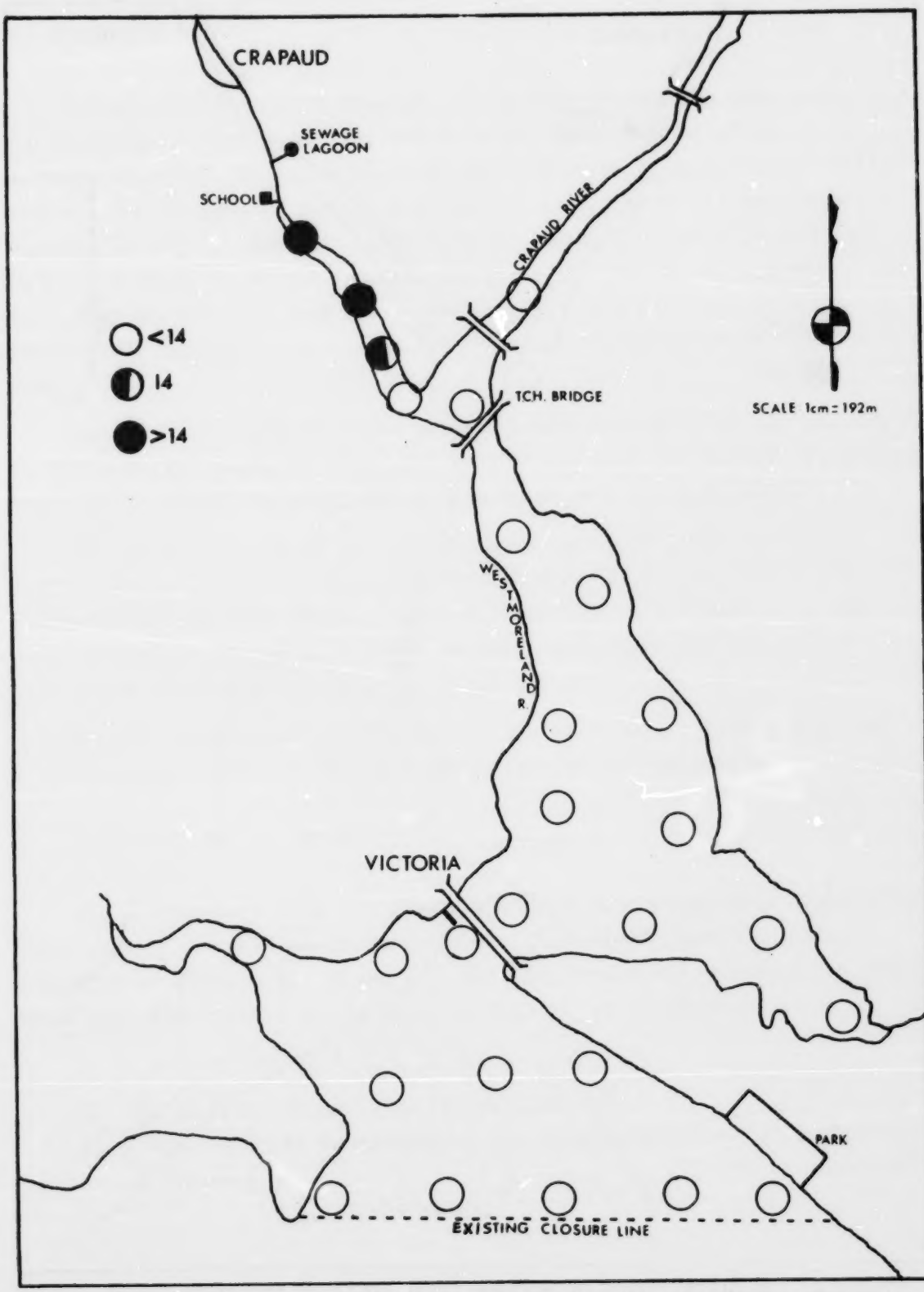

FIGURE 3 THE DISTRIBUTION OF MEDIAN FECAL COLIFORMS DENSITIES, 1976

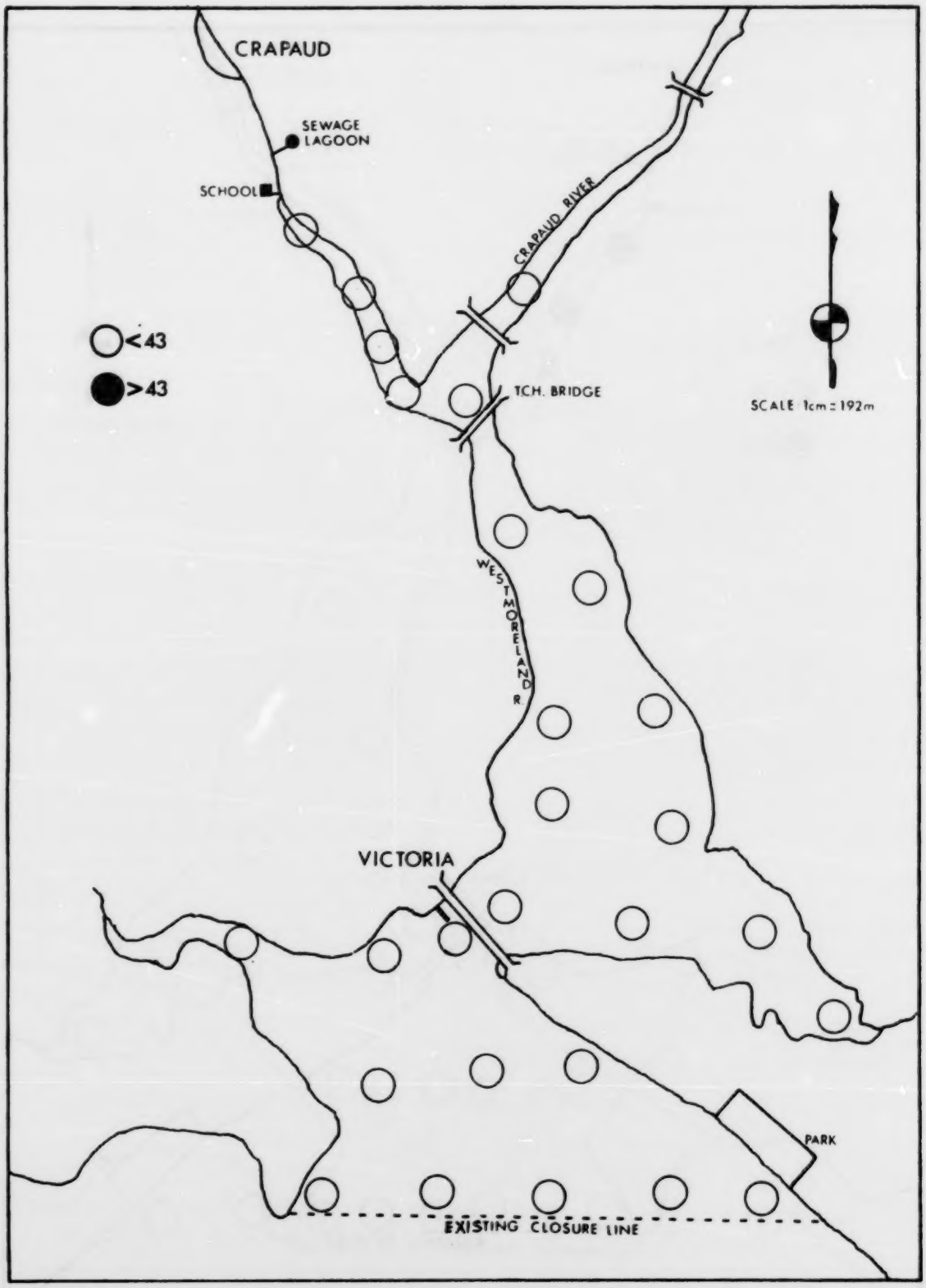

FIGURE 4 THE DISTRIBITION OF MAXIMUM FECAL COLIFORM DENSITIES, 1976

5. DISCUSSION

Bacteriological results obtained during 1976 demonstrate that, with the exception of station 27, 28, and 29 on the upper portion of the Westmoreland River, this area meets established bacteriological water quality cirtiera for an approved shellfish harvesting area. Fecal coliform levels measured on July 15 (Appendix Table A-1), following a rainfall of 24.7 to 25.9 mm in 48 hours, do not increase significantly over those measured during dry weather (eg. June 16). This suggests that this area is not particularly susceptible to a landwash situation following a high rainfall event.

Maximum fecal colfiorm levels for the entire area are less than 43 MPN/100 ml. Median Values exceed 14 MPN/100 ml only at stations 27, 28, and 29, although these median values are based on the results of only two sampling runs.

The sanitary survey of the area revealed two major point sources of domestic waste, the undisinfected effluents from the Crapaud lagoon and Engelwood Regional High School. Both of these sources are located on the upper reaches of the Westmoreland River just downstream from the village of Crapaud and their outfalls enter the River directly.

Bacteriological and sanitary survey results of this area indicate that a closure is warranted on the upstream section of the Westmoreland River.

6. CONCLUSIONS AND RECOMMENDATIONS

The Westmoreland River and Victoria Harbour meet established bacteriological water quality criteria for an approved shellfish harvesting area with the exception of stations 27, 28 and 29. Sanitary conditions reinforce the need for a shellfish closure on the upper portion of the Westmoreland River.

It is recommended that:

1) the existing closure line be rescinded and
2) a new closure be implemented on the Westmoreland River as depicted in figure 5

7. RECOMMENDATIONS OF THE MARITIME STANDING COMMITTEE ON SHELLFISH

The existing closure (8-1) on Victoria Harbour is not warranted. This closure should be rescinded and a new closure established as shown in Figure 6 of this report.

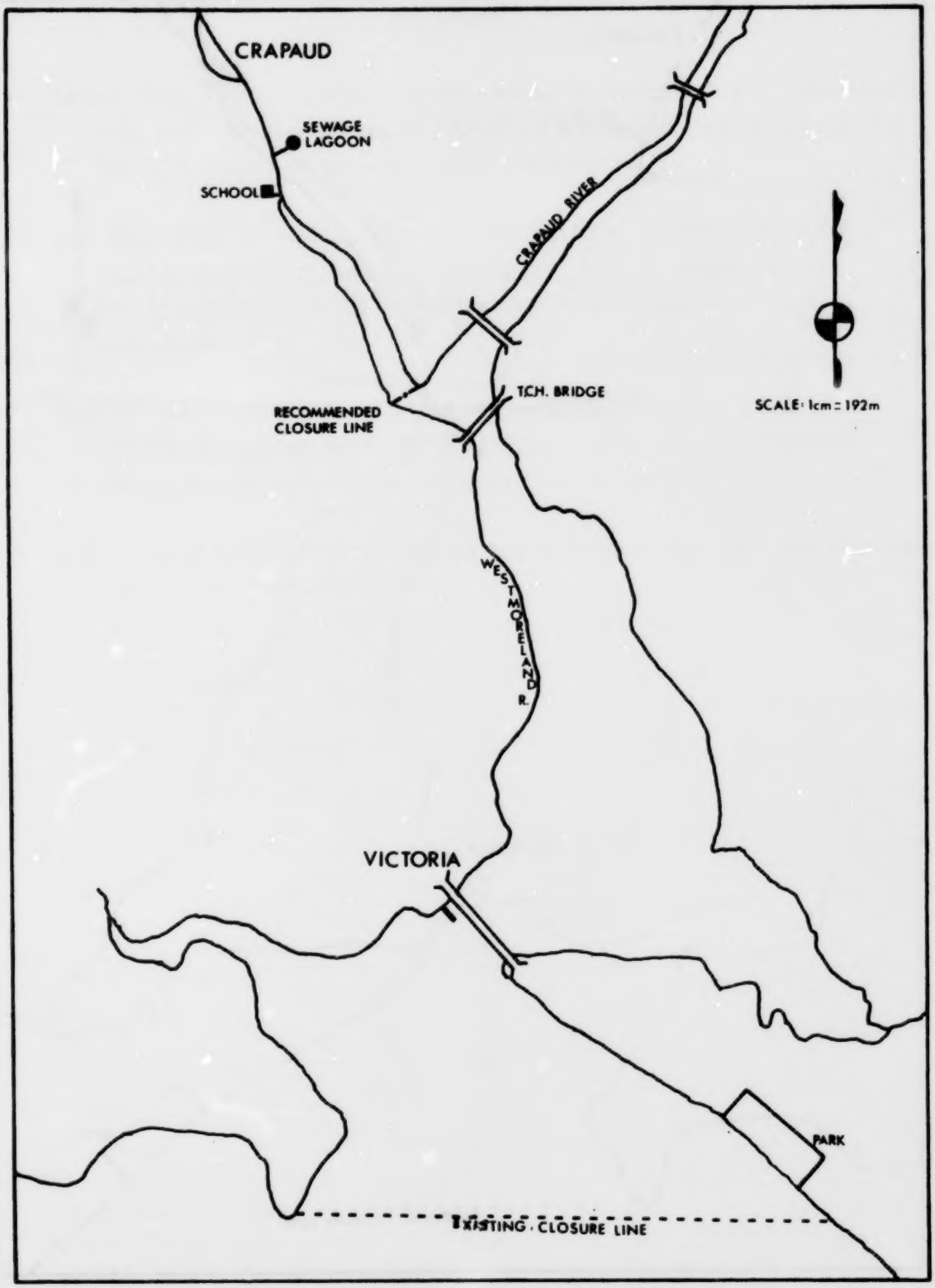

FIGURE 5 MAP OF SURVEY AREA SHOWING RECOMMENDED CLOSURE LINE

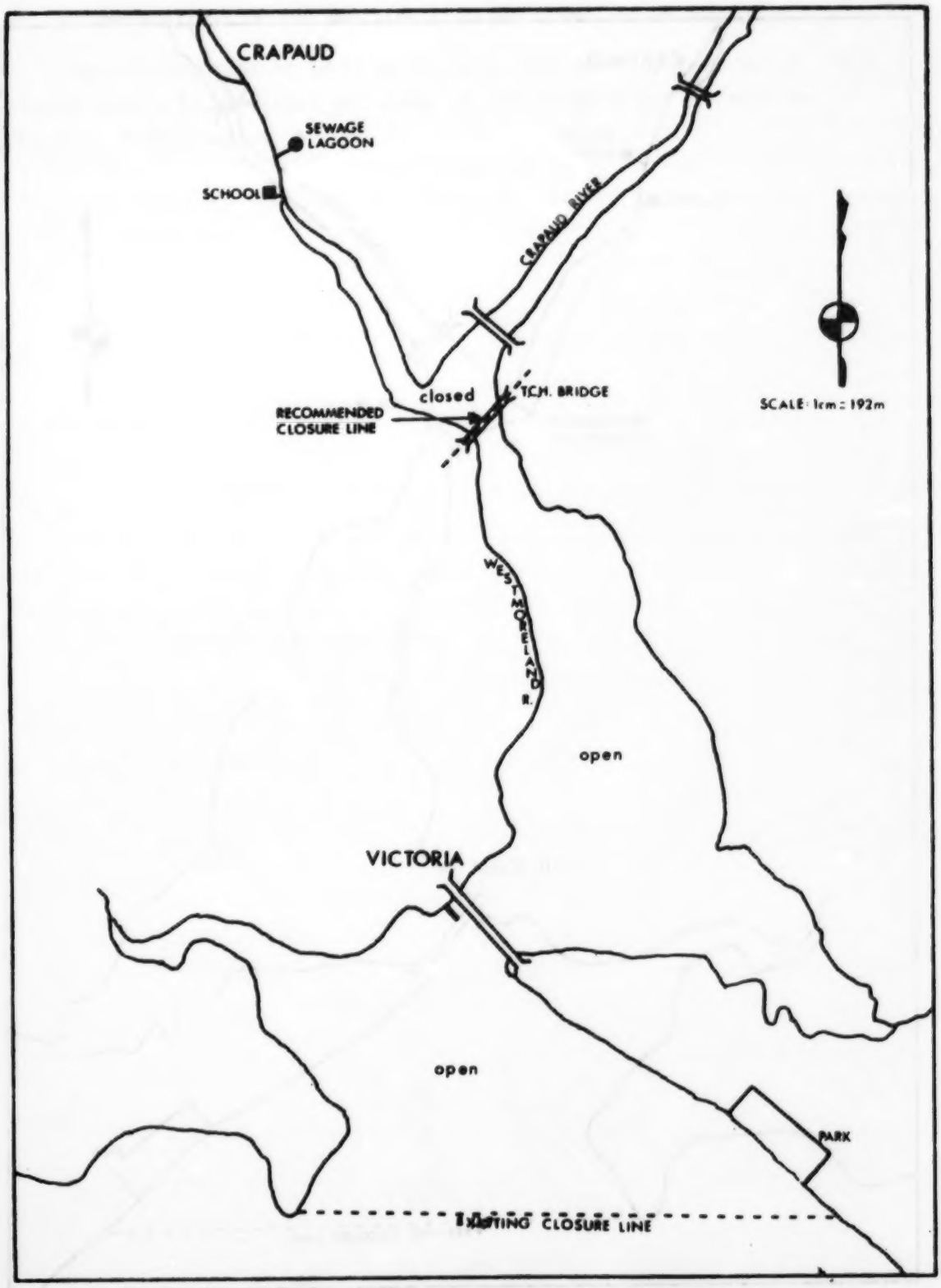

FIGURE 6 MAP OF SURVEY AREA (VICTORIA, P.E.I.), SHOWING CLOSURE RECOMMENDED BY THE MARITIME STANDING COMMITTEE ON SHELLFISH

REFERENCES

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2. U.S. Department of Health, Education and Welfare, National Shellfish Sanitation Program Manual of Operations, Part 1, Sanitation of Shellfish Growing Areas, 1965 Revision, Public Health Service, Washington, 32 pp (1965).

3. American Public Health Association, Recommended Procedure for the Examination of Sea Water and Shellfish, Fourth Edition, American Public Health Association, New York, 105 pp (1970).

4. Anon, Determination of Chlorinity by the Knudsen Method, G.M. Manufacturing Company, New York (1962).

ACKNOWLEDGEMENTS

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Particular appreciation is extended to Mr. J. Machell for the reviewing of this manuscript.

APPENDIX

APPENDIX TABLE A-1. FECAL COLIFORM RESULTS, VICTORIA HARBOUR - WESTMORELAND RIVER, MAY - AUGUST, 1976

STATION NO.	FECAL COLIFORM MPN/100 ml							
DATE TIDE	MAY 15 H.R.T.	MAY 25 H.F.T.	JUNE 16 L.R.T.	JUNE 18 L.F.T.	JULY 15 L.R.T.	AUG. 17 L.F.T.	MEDIAN	MAX.
1	<2	-	2	<2	<2	-	<2	2
2	<2	-	8	<2	<2	<2	<2	8
3	<2	-	17	2	<2	2	2	17
4	<2	-	8	<2	<2	<2	<2	8
5	<2	-	5	<2	<2	<2	<2	5
6	<2	-	5	2	9	11	5	11
7	<2	-	17	8	<2	7	7	17
8	<2	-	2	<2	<2	2	<2	2
9	<2	<2	17	2	4	<2	2	17
10	<2	2	2	9	<2	4	2	9
11	<2	<2	11	-	17	<2	<2	11
12	<2	<2	2	2	8	2	2	8
13	<2	<2	-	-	5	4	3	5
14	<2	<2	-	-	4	-	<2	5
15	<2	<2	-	-	14	-	<2	14
16	<2	<2	11	4	17	-	4	17
17	<2	<2	2	11	13	-	2	13
18	<2	<2	-	-	5	-	<2	5
19	<2	<2	-	-	-	-	<2	<2
20	<2	<2	-	-	-	-	<2	<2
21	<2	7	-	-	-	-	3	7
22	5	13	-	-	-	-	9	13
23	2	11	-	-	-	-	7	11
26	4	9	-	-	-	-	7	9
27	22	5	-	-	-	-	14	22
28	34	<2	-	-	-	-	17	34
29	33	<2	-	-	-	-	17	33

APPENDIX TABLE A-2 FECAL STREPTOCOCCI RESULTS, VICTORIA HARBOUR, WESTMORELAND RIVER JULY 15, 1976

SAMPLING STATION	MPN FECAL COLIFORM/100 ml	MF FECAL STREPTOCOCCI/ 100 ml	FC/FS RATIO
3	<2	<1	-
4	<2	29	<0.1
10	<2	17	<0.2
16	17	56	0.3

APPENDIX TABLE B-1 PRECIPITATION DATA, SUMMERSIDE, P.E.I., ATMOSPHERIC ENVIRONMENT SERVICE, ENVIRONMENT CANADA, HALIFAX, N.S. MAY-AUGUST, 1976

DAY	MAY		JUNE		JULY		AUGUST	
	RAIN MM	SAMPLING DAY	RAIN MM	SAMPLING DAY	RAIN MM	SAMPLING DAY	RAIN MM	SAMPLING DAY
1	0		3.1		2.5		22.9	
2	2.9		TR		0.3		1.8	
3	0.3		0		1.0		0	
4	TR		0		0		0	
5	0.5		0		0		0	
6	0.8		0		3.3		3.6	
7	15.5		1.5		0		0	
8	17.3		5.6		TR		0.8	
9	0		0		4.3		0.5	
10	0		0		0		6.9	
11	0		9.9		0		4.6	
12	3.8		4.1		TR		0	
13	0.3		0		21.3		0	
14	4.1		TR		2.6		1.8	
15	0.5	X	TR		2.0	X	0	
16	TR		0	X	0		9.4	
17	0		TR		19.9		TR	X
18	TR		0	X	1.8		0	
19	2.8		0		0.5		0	
20	0.5		0		0		0	
21	TR		TR		9.9		0	
22	9.4		0		0		0	
23	11.7		TR		0		0	
24	1.3		TR		37.9		0	
25	0	X	14.5		0		TR	
26	0		2.3		0		0	
27	0.3		1.1		4.1		9.7	
28	0		0		1.8		7.4	
29	0		10.9		0		TR	
30	0		TR		0		15.0	
31	TR		0		3.6		0	

TR = TRACE (<.01)

APPENDIX TABLE B-2 PRECIPITATION DATA, CHARLOTTETOWN, P.E.I., ATMOSPHERIC ENVIRONMENT SERVICE, ENVIRONMENT CANADA, HALIFAX, N.S., MAY-AUGUST, 1976

DAY	MAY		JUNE		JULY		AUGUST	
	RAIN MM	SAMPLING DAY	RAIN MM	SAMPLING DAY	RAIN MM	SAMPLING DAY	RAIN MM	SAMPLING DAY
1	TR		15.8		8.1		4.1	
2	9.7		TR		1.5		2.0	
3	TR		0		TR		0	
4	TR		0		0		0	
5	0.3		0		0		0	
6	1.0		0		3.3		2.5	
7	19.1		0.8		0		0	
8	26.7		7.9		11.9		1.5	
9	0		0		0		3.8	
10	0		0		0		0	
11	0		19.8		0		4.3	
12	8.1		4.1		TR		0	
13	4.3		0		23.9		TR	
14	2.8		0.3		TR		1.3	
15	9.7	X	0		0.8	X	0.8	
16	0		0	X	0.3		28.5	
17	0		TR		4.3		0	X
18	0		0	X	TR		0	
19	0.5		0		TR		0	
20	0.8		0		0		0	
21	0.5		0		2.0		0	
22	9.7		0		0		0	
23	6.1		0		0		0	
24	7.6		0		21.1		0	
25	TR	X	24.4		0		TR	
26	0		3.8		0		0	
27	TR		1.0		0		TR	
28	0		TR		0.8		12.7	
29	0		1.0		0		0	
30	0		0		0		37.6	
31	TR		0		5.1		0.5	

TR = TRACE (<.01)

APPENDIX TABLE B-3 SALINITY AND TEMPERATURE RESULTS,
VICTORIA HARBOUR-WESTMORELAND RIVER, 1976

SAMPLING STATION NO.	MAY 25-H.F.T.		JUNE 16-L.R.T.		JUNE 18-L.F.T.		JULY 15-L.R.T.		AUG. 17-L.F.T.	
	SAL. o/oo	TEMP. °C	SAL. o/oo	TEMP. °C	SAL. o/oo	TEMP. °C	SAL. o/oo	TEMP. °C	SAL. o/oo	TEMP. °C
3	-	-	29.5	17.0	25.6	17.0	27.1	18.0	25.6	19.0
12	28.2	8.0	26.5	18.0	25.9	17.6	27.1	18.4	25.9	19.3
29	0.8	9.6	-	-	-	-	-	-	-	-